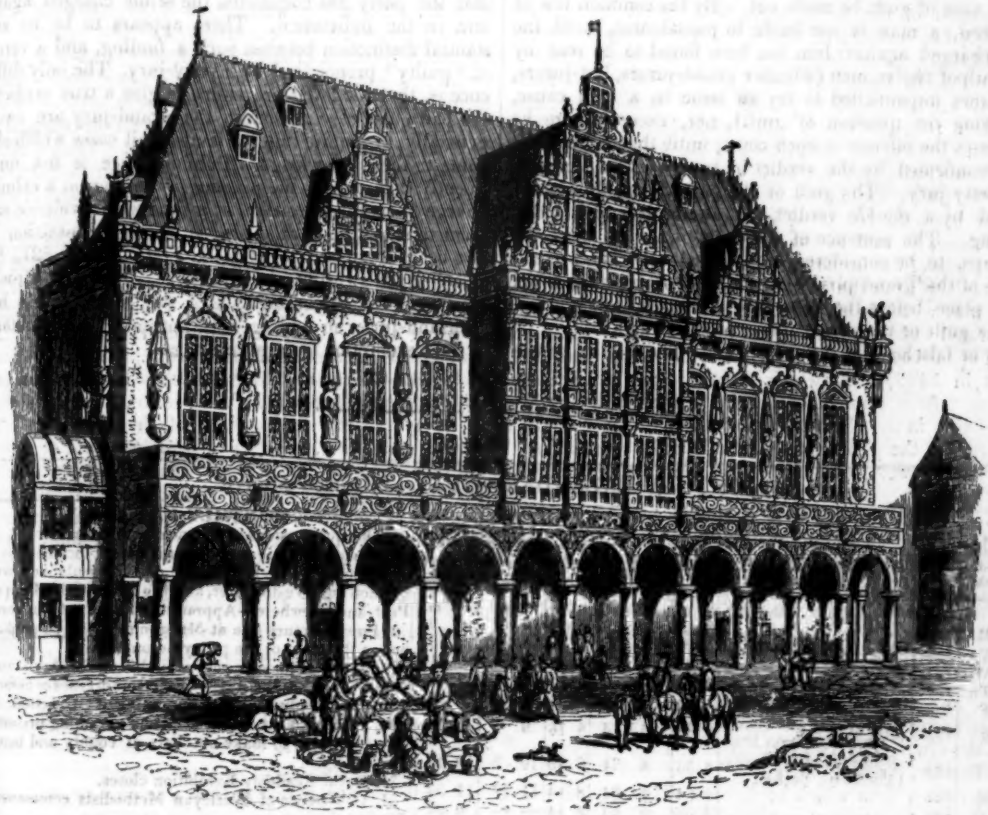
THE PENNY MAGAZINE

OF THE

Society for the Diffusion of Useful Knowledge.

466.] PUBLISHED EVERY SATURDAY. [JULY 6, 1839.

BREMEN



[Town-hall, Bremen.]

BREMEN, on the Weser, is one of the old Hanseatic towns whose history is connected with the commerce of that period of the middle ages when a solitary vessel scarcely dared yet to venture on the unprotected seas; for after the Vikingr, or sea-kings, had ceased to carry dismay on every coast, the peaceful mariner was harassed by their piratical successors, who, although conducting their plundering operations on a smaller scale, were scarcely less injurious to the rising interests of commerce. The Hanseatic League was a confederation of towns interested in maintaining a safe intercourse by sea, and from the period of its formation, at the end of the twelfth or the beginning of the thirteenth century, the piracies and disorders which it was intended to suppress gradually diminished. The prosperity of most of the old commercial towns on the Continent dates from about this period.

Towards the close of the eighth century, Bremen was made a bishop's see by Charlemagne, and subsequently it was incorporated with the archbishopric of Hamburg; but this led to a series of contests between the chapters of the two towns, which only terminated by Bremen being made the seat of the archbishopric. Bremen prospered under the government of its ecclesiastical rulers, who favoured its union with the Hanse towns, though, at a subsequent period, they opposed its recognition as a free town of the holy Roman Empire, a privilege which, however, it afterwards obtained. By the treaty of Westphalia, Bremen came into the hands of the Swedes, who converted the archbishopric into a secular duchy. In 1712 it became a conquest of Denmark, and was sold by that state to the electorate of Brunswick. It was not until 1731, when the adjustment of some disputes with the dukes of Brunswick took place, that Bremen again enjoyed its former freedom; which was again subverted by the French, who, in 1810, made it the capital of a department of the French Empire. It owed its restoration to independence to the battle of Leipzig and the downfall of Napoleon, and under the treaty of Vienna, Bremen, with 67 square miles of adjoining territory, became a member of the Germanic Confederation, and one of the three Hanse towns, Hamburg and Lübeck being the other two.

The Weser divides Bremen into two unequal portions; the old town, with its large suburbs containing handsome mansions and villas, being on the right bank, and the new town, begun in 1625, being on the left, without any suburbs. The narrowness of the streets and the lofty houses give a gloomy appearance to the more antient part

of Bremen, though it also contains some spacious streets, and in the new town they are generally wide and straight. Cemeteries have been formed outside the town, and the deserted church-yards, no longer employed as burial-grounds, allow of a freer circulation of air, and as these are almost the only open spaces of any magnitude in the old town, they render it more healthy. The ramparts, as we frequently find in old towns on the Continent, have been razed and converted into agreeable promenades. The quays on each side of the river afford a good view of the town. Bremen contains about 5900 houses and 1100 granaries, manufactories, warehouses, mills, &c. The population of the town amounts to rather more than 41,000, five-sevenths of whom are Lutherans, and there are 14,000 persons belonging to the Reformed Church, 1500 Roman Catholics, and about 1100 Jews. Individuals are admissible to public offices without reference to their religious creed. The cathedral, built in the twelfth century, and the church of St. Augarius, with its handsome spire 324 feet high, are the only ecclesiastical edifices possessing much interest. The archiepiscopal palace has been converted into a town-hall. This circumstance, as well as the razing of the ramparts, are indications of the important changes which public feeling has undergone in the course of centuries. The town-hall, a view of which is given in the cut, has been completely renovated within the last few years, and the piazzas have been opened to the public. Here is the former town-hall, built in 1405, below which are the large wine-cellars. We may form some notion of the heartiness of burgher hospitality in the olden times from the capacity of these cellars, but the pleasures of the table and a spirit of jovial conviviality were, at that period, the chief excitements which the state of society afforded. Wines of the vintage of 1624 are, or were lately, to be found in the town-hall cellars; and in one cellar there are a dozen vats called the Twelve Apostles, which contained hochheimer and rüdesheimer made early in the last century. There are apartments running down one side of the vaults for the convenience of regaling parties. The Exchange combines accommodation for men of business and pleasure, a large concert-room and ball-rooms being under its roof. In the Museum, erected in 1801, there are an extensive library, and collections in natural history and the arts. The two Gymnasia and the High School, the Theatre, Arsenal, Weighing House, and Dr. Olbers's Observatory, from which he discovered Pallas and Vesta, are the most prominent public edifices of Bremen.

The territory of the free Hanseatic state of Bremen consists chiefly of marsh land intersected by many watercourses and canals, and besides the Weser, by one or two small rivers. Agricultural industry is chiefly directed to the breeding of cattle, which are of a superior kind, and little corn is grown except in a few elevated places. In addition to Bremen, this little state comprises two other towns and fifty-eight villages and hamlets. The government is vested in a senate and in the "convention of burgesses," which consists of citizens paying a certain amount of taxes. The senate chooses its members by ballot, out of a certain number of candidates selected by the burgesses. They are elected for life, and exercise all executive functions, administering justice, regulating the police, licensing the ministers of religion, and controlling public instruction; and in their executive capacity they are responsible ministers. The convention, conjointly with the senate, determine the amount and application of the public revenue, and matters relating to commerce and navigation are more immediately under the control of the former body. The debt of the state exceeds 600,000*l*., and the annual revenue amounts to about 120,000*l*.

Manufactures of woollens, hats, tobacco, refined sugar, rape oil, soap, starch, cables, ropes, cotton yarn, cottons and silks, are carried on at Bremen; and there are also tanneries, flour-mills, breweries, and distilleries. It has in addition a very extensive trade both with foreign parts and the interior of Germany, being the emporium for the countries watered by the Weser. It is the seaport of the most considerable portion of the kingdom of Hanover, and of Brunswick and Hesse: the Elbe and the Weser are connected by a navigable canal. The annual exports are of the estimated value of 2¼ millions sterling, and the imports amount to about the same sum. The principal imports in 1832 were 31 million lbs. of tobacco, 29 million lbs. of sugar, 14 million lbs. of coffee, 39,000 tuns of South-sea whale oil, and 33,000 hogsheads and pipes of wine. These are warehoused at Bremen, and afterwards distributed for consumption. The returns from the interior consist of lead, copper, iron, iron-wire, glass, grain and potatoes, oak and fir timber, bark, drugs, hemp and flax, wool, rags, paper, linens, and other raw and manufactured articles. Only vessels drawing seven feet water can come up to the town. Vessels of the largest size stop at Braake, an Oldenburgh port, and their cargoes are put into boats and lighters and brought to Bremen. Smaller vessels can come up as far as Bergerac, a port within the state of Bremen. The number of vessels which cleared inwards at Bremen in 1832 was 1116, of which 120 were from Great Britain and 123 from the United States; and in 1835 the arrivals were 1085, of which 120 were also from British ports. The commercial interests of Bremen are represented by a body called the College of Elders, which is possessed of great powers in questions relating to trade and navigation, being in many respects independent of the executive. The charges on buying, selling, and shipping goods at Bremen are very moderate; and a Bank, Discount Office, and Fire Insurance Companies facilitate commercial arrangements. Bremen, as one of the three remaining Hanse towns, holds a share in the Steelyard in London and the Hanseatic House in Antwerp.

ON ULTRAMARINE.

THIS substance is one of the most beautiful and most costly colours which ever came into the hands of the artist. The blue is of an intensely vivid character, and possesses the valuable property of being almost unalterable by time. We shall give a brief description of the mineral from which it is obtained, and of the mode of preparation. Great attention has been paid to this substance in France, and it is from French sources that we shall draw our details.

The imperishable nature of ultramarine, which is regarded as one of its most valuable properties, is in some respects a fault, arising from the circumstance that it will not blend with other colours as time works its changes on the latter. If all other colours were as imperishable as ultramarine, then the fault of which we speak would be a virtue, since a picture would preserve its freshness for ages; but as it is, the ultramarine maintains its vividness after other colours have faded. It has been observed in some of the paintings of Perugino, Albert Durer, and Paul Veronese, that ultramarine was used for the sky, and inferior colours for other parts; and that the sky retains almost its pristine freshness, while the other parts have yielded to the effect of time, from which a want of harmony results.

The mineral which yields ultramarine is called *Lapis lazuli*, and is distinguished by a beautiful blue colour. The lapis lazuli, or *lazulite*, as mineralogists term it, presents itself in masses more or less pure, generally of small size, of a granulated texture, imperfectly lamellated, and of different tints of blue, from celestial blue to indigo and purple. It is generally disseminated in a rock composed of many substances, of which iron pyrites is always one. In commerce this rock goes by the name of *lapis*, and brings a high or low price according to the quantity of lazulite which it contains.

M. Patrin says, that when he was at Ekaterinburg in Siberia, he met with a dealer in precious stones, who had been in Bokhara, from whence the most beautiful specimens of lazulite are obtained; and he took that opportunity to learn the nature of the mountains in which the mineral is found. The dealer said that the mineral occurred in granite; and that it was not disposed in veins or filaments, but disseminated through the entire mass of the rock in all sorts of proportions;—that nothing was perceived but light blue patches and spots upon a rock which was in other respects grey;—that these spots were of an intensely vivid colour;—that some of the spots were less mixed up with foreign ingredients than others;—but that it was very rare to find masses so large as the head, in which the blue predominated over the white and grey.

These pieces of lazulite are generally quarried from the rocks, but sometimes they are found on the banks of rivers. Laxmann, who lived several years in Eastern Siberia, found rolled blocks of lazulite on the banks of the lake Baikal, in a gulf on the southern side; but he sought in vain for the mountain from which they had been detached, and the natives could give him no information on the subject.

Besides Bokhara and Siberia, other places have furnished this mineral; for instance, in Persia, in Natolia, in India; and it is said, that the isle of Hainon, in the Chinese Sea, furnishes all which is employed in porcelain and other species of painting in China.

Pure lazulite is almost transparent at the edges, and is hard enough to scratch glass, and to produce fire with steel. It is about three times as heavy as water; and when exposed to a moderate heat it burns with a vivid flame, loses its colour, and falls in the state of a greyish powder, which becomes a white enamel by the application of a stronger heat. Dufay found that when it was exposed to the sun's rays, and afterwards taken into the dark, it yielded a phosphorescent light, the light being more intense in proportion to the purity of the mineral.

The most perfect specimens of lazulite are not devoted to the preparation of ultramarine; they are always reserved for articles of *bijouterie*, and ornaments of various kinds, such as mosaics, &c. For these purposes it is sold in plates, excessively thin, in order to multiply the number out of a given weight as much as possible. A sort which is rather less perfect and costly is applied in the decoration of princely apartments, of which the most splendid in existence perhaps are in the palace, built by Catherine II. for Prince Orloff, her favourite, at St. Petersburg. In this palace, according to Patrin, are apartments entirely lined with lazulite brought from Bokhara.

The manner of preparing ultramarine, as described by M. Boèce de Boot, is as follows:—In order to determine whether a piece of lazulite is of good quality for the purpose, and fit to yield a fine blue, a few small pieces are placed upon burning charcoal, and made red-hot; if they do not break by the calcination, and if, after having cooled, they have lost none of the brilliancy of their colour, they are pronounced fit for the purpose. Another mode of trial is, to make some fragments red-hot upon an iron plate, and then throw them into very strong white vinegar: if the specimen is good, it will not lose its colour by this ordeal.

The lazulite is made red-hot several times in succession, and quenched after each heating in water or strong vinegar,—the latter being the better of the two: the oftener this is done, the more easily is the stone reduced to powder. This done, the lazulite is then pounded in a porphyry mortar, moistening it from time to time with vinegar or spirit of wine. The pounding is continued until the stone is reduced to an impalpable powder, for this is very essential. The powder is then washed in water, and left to dry; after which it is sheltered from dust until the next process.

A paste is made of a pound of pure linseed oil, the same weight of yellow wax, of colophone, and of resinous pitch, and two ounces of white mastich. The oil is gently heated, and the other ingredients added to it; the whole is then kept boiling for half an hour, being stirred all the time: it is then strained through linen, and left to cool. To six ounces of this paste are added four ounces of the powdered lazulite. This mass is kneaded for a long time, and with great care. When the powder is thoroughly incorporated with the paste, hot water is poured upon it, and well mixed up with it. By this process the colouring matter detaches itself from the other ingredients, and falls down to the bottom of the vessel; and after reposing some days, the remaining ingredients are poured off, and the sediment, when dried into a powder, constitutes ultramarine.

Kunckel followed a plan somewhat different. After having broken the lazulite into small pieces, he calcined it and quenched it in vinegar several times in succession; after which he reduced it to powder, in the way before described. He then took virgin wax and colophone, of each a quantity equal to half the weight of the lazulite, and melted them in a glazed earthen vessel. To this was gradually added the powder, stirring and mixing it carefully with the other ingredients. The melted mixture was then put into a piece of linen cloth, and immersed in a glass vessel containing water of such a temperature that the hand could just remain in it; and then the linen bag was squeezed, by which colouring matter exuded through the cloth and mixed with the water. When the water was strongly coloured the mixture was taken out and immersed in a second glass of water, by which a second supply of the colouring matter was obtained; and the same for a third and a fourth time. The colour which was discharged into the first glass of water was the most valuable, the others being gradually more deteriorated. The vessels were left three or four days, by which time the ultramarine settled at the bottom, and was afterwards dried.

The quantity of ultramarine which can be obtained from lazulite depends on the richness of the stone. When it is of a good quality, more than half its weight of colouring matter may be procured from it; but if it yield only one-quarter the weight, it is still worth the trouble and labour of reducing it. The high price which must be paid for ultramarine is well known. This is due to three causes: the rarity of good specimens of lazulite, the high price which is demanded for them when they can be obtained, and the time and trouble bestowed upon the preparation. In the year 1600 lazulite of a good quality brought from forty to fifty shillings a pound; and at subsequent periods the price has varied, according to the extent of the supply, from twenty to one hundred and twenty shillings per pound. In 1763 an ounce of the prepared ultramarine cost four pounds, being about equal to its weight in pure gold.

It is not easy to say whether ultramarine, or the mineral from which it is produced, was known to the ancient Greeks and Romans; but it has been supposed that the gem which was known at that time by the name of the *sapphire* was identical with the modern lapis lazuli. The grounds for this opinion are, that the sapphire was of a sky-blue colour, with a violet or purplish glance; that it was not always transparent; that it had a great many golden-yellow spots; that it was in general capable of being polished and cut; that it could be procured in pieces sufficiently large for mosaic-work; and for other reasons. Beckmann has endeavoured to trace the employment of lazulite from remote times to the present; but we cannot here follow him in his task, for want of room; merely observing that the first mention which he has discovered of the name *ultramarine* occurs in the year 1502.

WOOLSTHORPE MANOR-HOUSE.

[Sir Isaac Newton's birthplace.]

WOOLSTHORPE manor-house, the birthplace of Sir Isaac Newton, is situated in a little valley in the parish of Colsterworth, near Grantham, in Lincolnshire, at the distance of about 103 miles from London. The building itself presents nothing to attract attention; but as the house in which one of the best men and one of the greatest philosophers of modern times first saw the light, it will be viewed with affectionate reverence by all who esteem high genius and true nobleness of heart.

It is pleasant to know that the vast and penetrating mind which could dictate such a work as the 'Principia' was once an inhabitant of an insignificant cottage. It is pleasant to know that the author of such a theory as that developed in his great work, with all its dependent circumstances, was a mere man with all the cravings and affections of mortality; although there is something so vast and majestic in the conceptions embodied in the 'Principia,' that we imagine they could only be the productions of a god-like being, of an immortal and unerring mind! Yet, though his fame among men will last while the science he so enriched shall endure, there was nothing in his personal appearance or mode of life to distinguish him from his fellow-men with minds too small to compass his ideas even when developed with his own simplicity. Yes, the immortal Newton lived like other men—he ate, and drank, and slept; his dwelling was a cottage; his observatory his own garden; and here in the solitude of Woolsthorpe did he contemplate the glorious works of his Creator, and imagine the means by which the harmony of the universe is maintained.

The genius of Newton is now acknowledged by the whole scientific world; modern discoveries have altered and improved many sciences but imperfectly known in the days of Newton, and much has been effected in clearing the obscure departments of the study to which he directed his principal attention; but not all the efforts of modern philosophers, assisted by the mechanical skill of modern days, have been sufficient to darken the fame of Newton or to eclipse any of his discoveries. Those works to which he owes the admiration of posterity as well as of his contemporaries are so sufficiently well known that we may dispense with any particular mention of them, particularly as we could only give some short account of what would require to be treated at considerable length, and respecting which there are many sources to which we may refer for information.*

The private habits of this great man, as of many others, are not so generally known; we shall therefore present so much information on this head as we have been able to collect. Although the most trifling particulars in the life of a celebrated character are of interest to his admirers, they are not considered of sufficient importance at the time they occur to deserve to be recorded for the information of future ages; thus it is that we know so little of the motives which have actuated so many men in actions for which they are praised or blamed by posterity without sufficient cause; and in the present instance we have to regret that particulars of this nature are extremely scanty.

The Newtons appear to have located themselves at

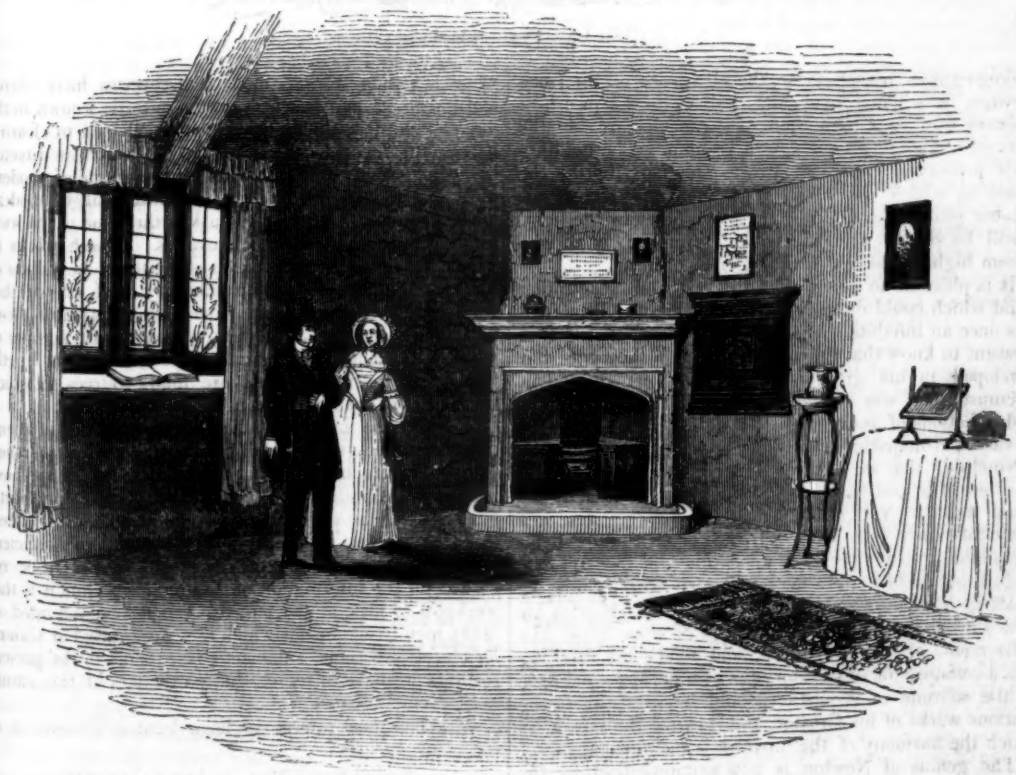
* See 'Penny Magazine,' vol. i., page 375.

Woolsthorpe as early as the year 1561, having come thither from Westby, in Lincolnshire. It has been said that the family derived its name originally from Newtown, in Lancashire; but it seems probable, from inquiries which have been made by the biographers of Sir Isaac, acting on some hints afforded by himself, that he was descended from a Scotch family of that name in East Lothian. The genealogy of the philosopher is however involved in considerable obscurity, and he could not himself trace his descent with certainty beyond his grandfather Robert Newton, who, in 1623, became possessed of the manor-house of Woolsthorpe, which had been bequeathed to him by Robert Underwood.

Sir Isaac Newton was born on Christmas-day, 1642, O. S., nearly three months after the death of his father. He was an extremely weakly child, and for some time it was thought he would not live; he is also said to have been so small for many days after his birth "that he might have been put into a quart pot." He did however at last spring up, and as he grew, gradually mastered the natural weakness of his constitution. The rudiments of his education were received at two small day-schools at Skillington and Stoke, in the immediate vicinity of his home, where he remained till he was twelve years of age, when he was removed to the great school at Grantham. Here he showed considerable quickness at his studies, and manifested a strong disposition for mechanics, in which he missed no opportunity for acquiring information, either theoretically or of a practical nature. He amused himself with making models of windmills, water-clocks, and other scientific toys, all of which he executed with considerable neatness and accuracy. Some of the sun-dials made by his own hand are still shown in the room used by him as a study at Woolsthorpe. Although his natural quickness of apprehension enabled him easily to master the exercises of the school, it does not appear that he was particularly partial to learning or forward in his studies. Indeed it is probable that it is to one of those accidental circumstances to which so many great events are ascribable, that we may partly attribute his future eminence. He used to relate that he was always very negligent at school, and very low in his class, until he happened to be insulted one day by a boy above him, when he determined to be revenged, not only by giving his superior a sound thrashing (which was promptly administered on the spot), but by the more noble method of superseding him in his studies. This determination gave a new bent to his character, and from that day he continued rising in the school till he was head boy. When he left Grantham school, it was determined by his mother, after great deliberation, and at the earnest solicitation of his uncle, who had observed indications of his great genius, to send him to Cambridge, whither he repaired in 1660, being admitted of Trinity College on June 5 in that year. Here he remained several years, applying himself closely to the acquisition of the more abstruse branches of knowledge, to the dissemination of which, means are appropriated in that university. The fruits of his studies were not made public until a very late period, and even then, only at the persuasions of his friends, and against his own well-known desire. Yet it is remarkable that nearly all the theories and opinions which have ranked his name first among modern philosophers, were conceived, and the demonstration of them considerably advanced, while he was yet a young man.

In 1665 he left Cambridge for a short time, in consequence of the plague, which in that year committed such ravages in all the great towns and cities throughout Europe, and retired to his house at Woolsthorpe (having inherited it in 1663 from his mother), where he passed the autumn of that year.

It was on this occasion, and while sitting in the garden, that the falling of an apple from a tree led to that train of thought which ultimately produced his beautiful theory of gravitation. At least such is the substance of a popular



[The Room in which Sir Isaac Newton was born.]

tradition, and it is so pretty that it would be cruel to deny the fact, although there are several circumstances which might lead us to doubt it; not the least of which is the total silence of his cotemporaries and diligent investigators of the circumstances of his life, Dr. Stukeley and Mr. Conduitt.

These gentlemen exerted themselves after his death to obtain every possible information with respect to the private life of Sir Isaac Newton, and it is from their relations principally that later biographers have drawn up their narratives.

Yet their accounts afford but little information besides that which may be obtained from the publications of Sir Isaac and the minutes of the Royal Society. He appears to have lived in a very retired manner until he took up his permanent abode in London, when, his fame having spread over Europe, his correspondence and society were courted by the most illustrious men of the age, as well foreigners as Englishmen. His nephew, Mr. Conduitt, thus notices the manner in which he lived:—"Sir Isaac lived in London ever since the year 1696, when he was made Warden of the Mint; nobody ever lived with him but my wife [his niece], who was with him near 20 years before and after her marriage. He always lived in a very handsome generous manner, though without ostentation or vanity; he was always hospitable, and upon proper occasions gave splendid entertainments." When he first came to London he lived in Jermyn Street, but he afterwards removed to a house in St. Martin's Street, Leicester Square, where he built an observatory, which still exists in its original state. Here he continued to reside till within a short period of his death, when he retired to Kensington, at which place he died March 20, 1727, in the eighty-fifth year of his age.

In person Sir Isaac Newton was of a middle stature, rather inclining to corpulency in his latter years. He had a benignant expression of countenance, to the effect of which his hair, white as silver, greatly contributed. He was blessed with a strong constitution, and to his last illness had the bloom of health mantling in his cheeks.

Mr. Conduitt says he had a lively and piercing eye, betokening the vivacity of his genius; but Bishop Atterbury would seem to be of a different opinion, though he may refer only to the latter part of his life. "Indeed," says he, "in the whole air of his face and make there was nothing of that penetrating sagacity which appears in his compositions. He had something rather languid in his look and manner, which did not raise any great expectation in those who did not know him."

In company Sir Isaac was very reserved, and particularly absent in mind. Of the latter failing, excusable however in a man whose attention was occupied with such abstruse subjects, there are many pleasant stories told, one of the best of which, and perhaps the only authentic one, is that given by Dr. Stukeley, who relates that after waiting at Sir Isaac's house for a considerable time without being able to see him, he was induced to demolish a fowl prepared for the philosopher's dinner. When Sir Isaac entered he appeared astonished to find the fowl gone, and exclaimed to his visitor, "You see, Doctor, how very absent we philosophers are; I really imagined I had not yet dined!" Indeed he would much rather sit down to solve a geometrical problem, than to discuss the most sumptuous dinner; and he would do one with as much celerity as the other.

When Leibnitz proposed a problem intended to puzzle the philosophers of all Europe, Sir Isaac Newton solved it within six hours after he had received it; and previously he had returned an answer in as short a time to one proposed by Bernoulli, for the solution of which Leibnitz had requested an extension to 12 months of the period of six months originally assigned.

The Manor House of Woolsthorpe (of which we have given an engraving, as well as of the interior of the room in which Sir Isaac Newton was born) is still preserved as a venerated relic by its present proprietor. After the death of Sir Isaac, John Newton, the heir-at-law, succeeded to the manor and estates; but in 1732 they were sold to Edmund Turner, Esq., in whose family they still remain. The house was repaired in 1798, and a marble tablet fixed in the room where Newton was born, with these lines by Pope:—

"Nature and Nature's laws lay hid in night;
God said, 'Let Newton be,' and all was light."

THE ERIE CANAL.

The longest direct line of canal, and indeed the greatest national work yet completed in America, is the inland communication between the waters of the Atlantic and Lake Erie, which is generally known by the name of the Erie Canal. The name however is not so peculiarly appropriate at the present day, since there are several other navigable communications between Lake Erie and large rivers falling into the Atlantic Ocean; amongst which are the Welland and Rideau canals, by which a communication is opened between Lake Erie and the St. Lawrence river; the canals connecting Erie with the waters of the Susquehanna and Alleghany rivers; and the Ohio canal, which is navigable through the interior of that state, from Lake Erie to the river Ohio, and thence down the Mississippi to New Orleans and the Atlantic.

From what the American people have said and written concerning the Erie Canal, many persons have been led to imagine that the pure waters of the little inland sea (Erie) are actually made to mingle with the briny ocean. But this is by no means the case; for notwithstanding the very considerable elevation of that lake above the tide-water level, the intervening country is of such a nature that the summit-level of the canal is several feet higher than the waters of the Niagara river where they issue from the lake, and from which the western section of the canal is fed or supplied.

The entire length of the Erie Canal—that is, from Albany on the Hudson river (which is navigable for sloops and steam-boats thence to New York) to Buffalo, situated at the eastern end of Lake Erie—is something over 362 English miles. The whole extent of the canal lies through the western and north-western portions of the state of New York; so that although the regions to the west of Buffalo share in the advantages afforded by means of this outlet, of sending their surplus produce to market, and of receiving sea-borne supplies in return, it was the state of New York alone that incurred the immense cost of this vast undertaking.

Notwithstanding the region of country through which this canal passes is, on the whole, rather level than otherwise, yet there are some particular localities which required an immense outlay of labour and expense to overcome the difficulties that presented themselves, and that none but an enterprising people would have ventured to cope with. Two of the principal of these, and certainly those of the greatest magnitude, were the pier at Black-rock, and the 'Deep-cut' and locks near the site of the present town of Lockport. It ought previously to be stated, in order to render the matter more intelligible, that where the Niagara river issues from Lake Erie it is bounded by a lofty bank on the eastern or United States side, so that it was almost impracticable to carry the line of canal along this steep and extensive declivity. But as this was not conceived the most desirable point for the canal to terminate at, some plan had to be adopted in order that it should be continued to the creek or harbour at Buffalo; so that vessels navigating Erie and the upper lakes might discharge their cargoes at once into the canal-boats, or the canal-boats their merchandise into

the vessels navigating the lakes. This being the case, a vast pier-wall, nearly two miles long, was planned and executed, though the execution was found a matter of considerable difficulty. This pier is built transversely along the channel of the river, commencing a little above the head of the rapids (for the descent is very rapid where the river issues from the lake), and terminating or abutting at a small island a little below the town of Blackrock. And to complete this reservoir, or basin, a strong dam (containing a guard lock) extends across that portion of the channel of the river lying between the aforesaid island and the eastern shore. The depth of water along the channel of the river, where this pier-wall had to be constructed, varied from fifteen to twenty-four feet; while the rapidity of the current (flowing over an irregular bed of rock) equals six or seven miles per hour. This work consists, not of a solid wall of masonry, but of a succession of huge cribs or frames, of exceedingly stout timbers, which, after being sunk in their proper positions, were filled with stones, in order to enable them to resist the pressure of the head of water raised within the basin. To have rendered them perfectly water-tight would have been nearly impossible, considering the uneven bed of rock upon which they rested; but since the basin was formed of a width varying from 50 to 80 yards, the waste of water when the work was completed did not materially affect the head of water obtained within the basin, or harbour of Blackrock, as it is generally called. During the time this great work was in operation, a cradle or crib would occasionally give way, being driven outwards by the pressure from within, when the water escaped with such velocity, that the noise thereby created might be heard at a considerable distance. When this great undertaking was finished, the inhabitants of Blackrock imagined that they would then enjoy a better harbour than their neighbours of Buffalo, and consequently become their successful rivals in the trade connected with the country bordering upon the lakes to the westward. But time has proved to them that they were mistaken in their calculations; for since this pier was completed, in the year 1825, the town (now city) of Buffalo has "gone a-head," to make use of an Americanism, at a rapid rate, while the town of Blackrock has increased but very little.

The next vast undertaking connected with the Erie Canal is the Deep-cut, including the double tier of locks at Lockport. This 'cut' (as it is called) extends through nearly the length of three miles, the whole distance being through a table-rock of solid stone. It is not only that the difficulties connected with this portion of the route of the canal have been overcome, but the work has been executed in a manner that reflects great credit upon the talents of the engineer that directed the undertaking. It seems that it was necessary that the waters of Lake Erie should be made to supply this portion of the canal; hence the necessity for raising the head of water in the Blackrock basin, and also for the labour of cutting a deep channel through this intervening rocky table-land. The capacity of this canal admits boats of a large size; consequently, the locks connected with it have to be of large proportions too. The town of Lockport, situated upon the brink of the before-mentioned table-land, and where the line of canal descends into the plain below, by a double tier of splendidly-executed locks, arose in the wilderness as if by enchantment, as did also many other towns along the said line. But like many other American towns of mushroom growth, it arrived nearly at its present size and importance by the time this great public work was completed.

Eastward from Lockport there is nothing peculiarly interesting along the line of canal until it reaches Rochester, one of the young and most flourishing towns in the western part of the state of New York. At this place the canal is carried over the Genessee river by means of a very handsome aqueduct, where the river is exceedingly rapid, and but a short distance above the principal Fall of the Genessee, one of the finest cataracts on the American continent. At one leap of 90 feet this fine river plunges into a vast basin, surrounded by rocks nearly perpendicular; after which it passes through a rocky channel (for the most part) to Lake Ontario, the distance being seven miles. The Genessee at Rochester is probably as large as the Thames at Brentford; and the roar of the principal cataract (for there are several others) may be heard at a considerable distance.

Continuing eastward from Rochester, in many places the canal originally passed through unpeopled regions; but since the route was first established, most of the lands lying contiguous thereto have been sold at high prices, and population on the entire line has rapidly increased. To enumerate the long list of new towns and villages that owe their existence to this canal, would require more space than the subject seems to require. The next town of much importance after passing Rochester is Palmyra, a place of respectable size and importance. At Lake Port a branch canal communicates with the two fine lakes Seneca and Cayuga, each about 40 miles long, and navigated by sailing and steam-boats. And it may be stated, in passing, that from the town of Ithaca, at the head of Cayuga lake, there is a railroad to the Susquehanna river at Oswego, and thence a water communication to the Chesapeake Bay and the Atlantic. The next place of much consideration is Syracuse. From this place there is a water communication with Lake Ontario at the mouth of the Oswego river, by which the commerce of that lake is connected with the city of New York. Utica, which is a large and flourishing town, is the next place to be noticed; but it should have been stated, that in the vicinity of Syracuse, immense quantities of salt are manufactured, from whence this necessary article is sent to almost every part of the country. From Utica a canal has lately been completed to Binghamton on the north branch of the Susquehanna. Until the canal passes Syracuse, its general route is nearly parallel with the shore of Lake Ontario, the distance varying from six to fifteen miles.

From Utica the line of canal follows the valley of the Mohawk river to where it falls into the Hudson; and as there is a considerable descent in the upper part of the valley, considerable lockage and expensive cutting were necessarily required. At a place called Little Falls the valley is exceedingly narrow; and the scenery in some portion of this part of the canal is not only very beautiful, but highly picturesque. The city of Schenectady is the last town of importance on the line of canal, and in consequence of the route being both difficult and circuitous from hence to the Hudson, and so to Albany, a railroad was constructed a few years ago connecting these two cities, the distance being about 15 miles, but by the canal route nearly 30 miles. Before the Mohawk reaches the Hudson it has attained a respectable size, which may easily be conceived when it is borne in mind that it has run a longer course than any river in Great Britain; and yet it may be considered a fourth or fifth rate river in America.

Previous to the canal reaching the Hudson, there are several cataracts in the Mohawk river; so that this descent has to be overcome by several locks of considerable lift; yet, notwithstanding all the difficulties that presented themselves, the genius of a Clinton and the energies of an enterprising people overcame them and completed one of the greatest works of art that has been accomplished by any nation in modern times.

Although the canal terminates at the basin formed at Albany, yet many of the canal-boats from Buffalo and intermediate places are towed down the river to New York, where the produce of the west is for the first time unshipped. The packet-boats upon the Erie canal are

uncommonly fine, large, and comfortable vessels, being well supplied with provisions, and having first-rate accommodations for passengers. They do not, however, travel rapidly; about 100 miles per day, or a little less, and the charge is about three-halfpence a mile, including boarding and lodging. During the latter part of the summer season, when the weather happens to be drier than usual, there is a scarcity of water in the most elevated section of the canal (a level of 12 miles), so that there is not sufficient water to float the heavily-laden boats through this said summit-level. When this is the case, it may happen that the packet-boats are obstructed in their way by the freight-boats that draw more water; so that with the numerous locks, and other casual obstructions, the travelling upon this canal is rather a tardy and tiresome business.

THE ECONOMY OF AN ENGLISH WORKHOUSE.

[From a Correspondent.]

UNDER the amended system of Poor Laws lately introduced into England, the economy of the workhouse has been very materially altered and improved, and my object, in this paper, is simply to describe the classification and discipline at present pursued in these receptacles, and the end which they are intended to promote.

The inmates are divided into four classes:—1. Men, and youths above seven years of age. 2. Aged and infirm women, and girls above seven years of age and under sixteen. 3. Able-bodied women, and girls above sixteen. 4. Children under seven years of age. To each of these classes separate apartments are assigned, in which they respectively remain, without communication with any other class; but the Guardians of the Union, with the consent of the Poor Law Commissioners, are empowered to suspend this rule in the case of married couples, of the aged and infirm class.

All the inmates, except the sick, the aged and infirm, and the young children, are required, between the 25th of March and the 29th of September, to rise at six o'clock, breakfast between half-past six and seven, begin work at seven o'clock, dine between twelve and one, leave off work at six o'clock, sup between six and seven, and retire to bed at eight o'clock; and during the other part of the year the hour of rising is an hour later. The Master of the Workhouse is empowered (subject to the directions of the Board of Guardians) to fix such hours of rising and going to bed, and such occupation and employment for the aged and infirm and children, as may be suitable to their respective ages and conditions. The boys and girls are required "for three of the working hours, at least, every day, to be respectively instructed in reading, writing, and the principles of the Christian Religion, and such other instructions are to be imparted to them as are calculated to train them to habits of usefulness, industry, and virtue." The diet of the paupers is so regulated as in no case to exceed, in quantity or quality, the ordinary diet of the able-bodied labourers living within the district of the Union in which the Workhouse is situate. Suitable exceptions are however made in the diet of the aged and of children, and the sick are dieted as directed by the medical officer. No spirituous or fermented liquors are allowed to be consumed within the Workhouse, unless under the direction of the medical officer. No pauper is allowed to work on his own account, it being considered that the Union which supports him is entitled to the full produce of his labour. On the request of any of the inmates, a licensed minister of their own religious persuasion is allowed to visit the Workhouse for spiritual purposes, and also to instruct their children in the principles of religion. Besides this, Divine Service is required to be performed in the Workhouse every Sunday, at which all the paupers are required to attend, except the sick and the young children, those who are too infirm, and such inmates as may object to attend on account of holding religious principles differing from those of the Church of England.

To the aged and infirm, and to deserted children and orphans, the Workhouse affords a comparatively comfortable asylum; its classification and discipline increase the stimulus to independent exertion, by holding out no inducement to the idle and improvident to seek in the Workhouse a refuge from honest labour. In many respects the Workhouse is preferable to the dwellings of the labouring population in general. The inmates are supplied with a sufficiency of wholesome food and clothing, a better bed than they are used to lie upon at home, a cleaner and better ventilated room, immediate medical attendance in case of illness; and a degree of order and cleanliness exists which is unknown in their cottages. It is, therefore, quite obvious that if it were not for the effect produced by the restraints of regularity and order, the Workhouse would be rendered wholly ineffective as a test of destitution, and, consequently fail in discouraging able-bodied pauperism. There is little doubt that the improved management of Workhouses has tended to increase amongst the poor habits of temperance, forethought, and economy, and a greater degree of reliance upon their own unaided exertion for subsistence. Such discipline is founded on the strictest principles of justice.

Though the pauper has claim upon the parish for relief, yet he is not the only person concerned. Regard must likewise be had to the rate-payer, whose condition is in many cases but slightly removed from pauperism, and whose very independence, supported at the cost of many pinching privations, renders him liable to contribute to the support of the improvident pauper. The indolent and dissolute are led to perceive the necessity of individual exertion; and the industrious and sober man is relieved from the burthen of supporting his improvident fellow-labourer. It is quite clear that by rendering the condition of the Workhouse inmate superior to that of the lowest class of self-supported labourers, a direct boon is held out to pauperism, and the incentives to obtain an independent livelihood are materially weakened. In a word, if the salutary restraints of the Workhouse were removed, either wholly or in part, pauperism would unavoidably increase, and everything like independence would totally and rapidly disappear. Upon the judicious application of those restraints depends, therefore, in no small degree, the physical and moral amelioration of the great bulk of the working classes.

Cultivation of Potatoes.—So recently as 1768, White of Selborne writes:—"Potatoes have prevailed in this little district, by means of premiums, within these twenty years only, and are much esteemed here now by the poor, who would scarce have ventured to taste them in the last reign."

Nature's Workmen.—There are three creatures, the squirrel, the field-mouse, and the bird called the nut-hatch, which live much on hazel-nuts, and yet they open them each in a different way. The first, after rasping off the small end, splits the shell into two with his long fore-teeth, as a man does with his knife; the second nibbles a hole with his teeth, as regular as if drilled with a wimble, and yet so small that one would wonder how the kernel can be extracted through it; while the last picks an irregular ragged hole with its bill; but as this artist has no paws to hold the nut firm while he pierces it,—like an adroit workman, he fixes it, as it were in a vice, in some cleft of a tree, or in some crevice, when, standing over it, he perforates the stubborn shell.—White's *Natural History of Selborne.*

*** The Office of the Society for the Diffusion of Useful Knowledge is at 59, Lincoln's Inn Fields.

LONDON:—CHARLES KNIGHT & CO., 22, LUDGATE STREET.

Printed by WILLIAM CLOWES and SONS, Stamford Street.